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FIELD NOTES ON RHODODENDRON CATAWBIENSE

By W. A. Cannon

On Roan Mountain, North Carolina, occur four kinds of laurel, namely, the flame-colored azalea (*Azalea lutea*), the great laurel (*Rhododendron maximum*), the mountain laurel (*R. Catawbiense*) and the American or ivy laurel (*Kalmia latifolia*). I had a good opportunity to observe these plants, especially the mountain laurel, while spending the season collecting plants from the middle of June until October 1902, on the summit of Roan, and since these observations were made with comparative difficulty, it may be considered an economical measure, to record them; it is to be hoped that the facts presented although fragmentary, may not of themselves be without interest.

Where the Laurels grow

When in June a visitor to Roan alights from the train at the nearest railway station * and looks about him, he will have little difficulty in seeing the American laurel, or "ivy" as it is called by the mountaineers, which at the time is in full bloom. This rather ornamental shrub is striking and beautiful, indeed, when covered with its pink flowers. It may be seen on the banks of the Doe River all the way to the foot of the mountain, which is about 1,000 feet above the station and five miles distant from it, but it is not so abundant at a higher altitude although to be observed at 4,500 feet altitude.

Associated with the American laurel is to be found the great

* Roan Mountain on the East Tennessee and Western North Carolina R. R., 2,700 feet altitude, fifteen miles from the summit of Roan.

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laurel, but not in flower in the middle of June; it does not blossom before July. Like the American laurel, this species, as a rule, does not occur in the higher altitudes.

Both of the species just mentioned may be seen from the wagon road going to the top of Roan, but the other two occur only on the summit, or in places more or less remote from the main traveled way. I know of only two places about five miles apart on Roan, where the flame-colored azalea grows, and there it is represented by only a few specimens. In both cases the altitude is above 5,000 feet. I presume, however, it may occur in lower altitudes and in favorable, that is, warm locations.

When, on the way to the summit of Roan, Carver's Gap with an altitude of 5,400 feet is reached, the road turns sharply to the westward and ascends in several "switchbacks" through a second-growth and open balsam forest nearly to the top of Roan High Knob, which it skirts on the way to the hotel (Cloudland). It is on the side of the High Knob, among the groups of balsams, that the visitor gets his first glimpse of the mountain laurel. This is in blossom in June. The rounded shrubs, about six feet high, are covered with bouquet-like clusters of large lilac-purple flowers, which are richly set among the dark green leaves. As the hotel is reached, or, better still, if Roan High Knob is ascended, the visitor gets such a view as he is likely not soon to forget. Some distance to the westward on a rounded lower summit a huge bed of rhododendron spreads out which mounts by an easy incline to the other high eminence, Roan High Bluff. In the distance the individuality of each plant is lost, and the massing of the blossoms of thousands of shrubs produces a wealth of color on the summit, beautiful beyond description.

The leading Plant Formation on Roan

But not every rhododendron even in fruitful years is so richly laden as those just described. The abundance of flowers is primarily associated with the local distribution of the shrub, and also with other facts of significance in its biology, as with its form and duration of life. In order better to understand this, and also before going further into the subject, it may be best to

glance at the main plant formations on the mountain namely, forest, shrub and meadow.

There are two kinds of forests, deciduous and coniferous. The former, as a rule, occupies the lower reaches of the mountain, but may extend upward to an altitude of perhaps 5,800 feet. The coniferous forest, the dominant trees being Frazer's balsam and the black spruce, is found on the uppermost slopes only, extending downward into the gulches or on the northern side for a considerable distance.

The rounded summits of Roan are mainly covered either with shrubs or meadows. The shrub formation is composed of a low

FIG. 1. *Rhododendron Catawbiense* growing with *Dendrium buxifolium prostratum*. The illustration shows the rounded outlines characteristic of this rhododendron.

alder, the rhododendron (*R. Catawbiense*) and the small heather (*Dendrium buxifolium prostratum*). The two former are the dominant plants, and generally these are not mixed but occur in separate areas. Between the alders and the forest the line is sharply drawn. But between the rhododendrons and the forest this is not the case and they may grow in the more open balsam woods. While small plantations of rhododendron occur here and there in the open throughout the upper reaches of the mountain, the largest area exclusively occupied by it lies between Roan High Knob and Roan High Bluff and comprises perhaps 80 acres. This is the formation which in June is so conspicuous with its mass of flowers.

The Form of R. Catawbiense

If we examine a rhododendron shrub, which is growing in the large plantation just referred to, or in any location away from the forest, and compare it with a form growing among the balsams we see certain variations in the plants themselves characteristic of the different habitats. In the first place, the shrubs in the open are not so tall, measuring 2–7 feet; they are more rounded in outline; they are more dense and branch much more richly; and in addition they flower more abundantly. The shrubs among the trees, on the other hand, are often tall, slender and extremely irregular in form, they branch but little, and they flower rela-

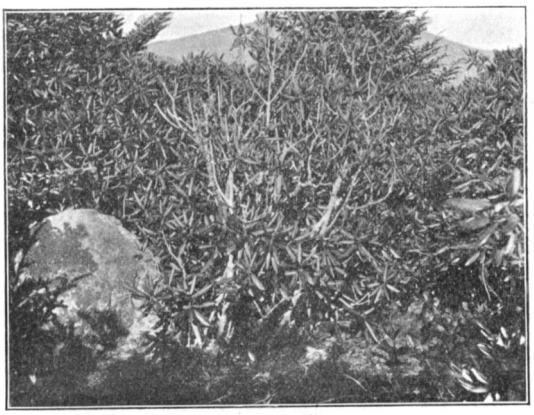

Fig. 2. *Rhododendron Catawbiense* with young shoots or suckers springing from the base of its branches.

tively seldom. As an example of the habit of the latter I may cite a plant of which one branch was over seven feet high and unbranched, and which had not borne a flower.

As will presently appear, the variation in habit just mentioned lies primarily in the characteristic difference in the number of flowers borne, and in the relation of the flowers to the axes of the plant.

A mature rhododendron shrub has no main stem with lateral branches, but on the contrary, is composed of several shoots likely of coördinate rank, which are of themselves branches, and

each of which may branch several times before terminating in the ultimate twigs upon which the flowers and leaves appear.

The flowers are arranged in umbels, they are terminal, and in each case they end the growth of the twig.

The leaves of each branchlet are in one, two, or rarely three interrupted groups, from four to six leaves each. The variation in the number of groups of leaves is correlated with the differences in the habitat of the plants, and varies with the time of year. Uniformly the shrubs growing among the balsams have at least one or two groups of leaves more than those away from the forest, or, in other words, the leaves on such shrubs may live one year or more longer than those on the open growing plant. In the axils of the leaves are buds, each or all of which may develop, or, as will be shown later, they may remain latent. If two or more buds grow, the respective branches which they form make a more or less wide angle with the parent branch; if, on the other hand as perhaps most frequently happens, one only develops, the new branch turns upward and takes a direction parallel to that of the parent, pushing the flower cluster, now become the fruit, to one side. Sometimes it happens that none of the axillary buds develop, in which case of course the branch either retains its integrity, or if the terminal bud is a flower-bud, the branchlet dies. Now it happens that if a leaf-bud terminates a branchlet, the development of the axillary buds appears to take place much less frequently than when the terminal bud is destined to give rise to flowers. It thus happens that profuseness in flowering brings about wealth of branching, and since the plants in the open blossom more than in the forest, that the former are also more abundantly branched.

A peculiarity which the rhododendron grown in the open shows as regards the branching, accounts also for the rounded outline characteristic of such forms. This shape is so noticeable that, as suggested by a visitor to the mountain, the shrubs appear as if they were cropped by grazing cattle. So far as I have observed, however, they are not subject to their attack. Rather the symmetrical form is occasioned by the nearly equal and similar development of its constituent branches.

The Duration of the Life of the Rhododendron

We may now turn to examine the causes which determine the life limit of the average rhododendron shrub, but before doing so it will perhaps be best to review briefly the structure of the buds, both leaf and flower.

An examination of the rhododendron in August or early September, shows that the flower and leaf buds for the following year's growth are already formed, and are easily to be distinguished. The flower bud is much the larger, being about three quarters of an inch long, and relatively stout. A longitudinal section shows that the young flowers are each subtended by a relatively long bract, and that the young cluster itself is enclosed by several

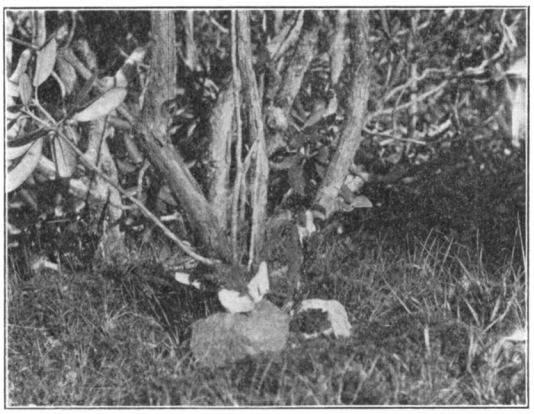

Fig. 3. Branches of *Rhododendron Catawbiense* which have been cut across slightly below the surface of the ground. Young shoots springing from basal buds are shown.

overlapping scales. When the flower bud develops the latter fall away, as do the bracts also, and the basal portion of the growing flower stalk is left quite naked.

In August the leaf-bud is composed of many overlapping scales, but the young leaves may not be distinguished readily. In the following spring, however, when the leaf bud grows, it is to be observed that the basal scales early fall away, as in the flower bud, and leave that portion of the developing stem entirely

bare. It thus happens that the leaves are arranged as previously stated in interrupted groups.

How many years constitute the life limit of the average rhododendron? I put this question to myself many times as I walked among these shrubs, and found for reasons which will presently appear, that in the end I was unable to answer it satisfactorily. It should be observed that this is very different from asking the age of a branch, a thing which can very readily be estimated. For determining the latter I have selected a representative branch of an average shrub in which I was able to distinguish twenty-eight yearly increments to its length, and thirty-one annual rings of growth. From its position in relation to the other branches I thought it to be at least one of the first to develop, if it was not the primary stem, a fact I was unable to determine. Thus, that branch was at least thirty years old, whatever may have been the age of the portion from which it sprang.

One is struck by the rarity of dead rhododendrons. I have seen very few, and upon investigating the probable cause of death of these, I always found it due to some catastrophe as the washing away of the soil. Whether the rhododendron as a plant rarely dies, the twigs and branches do, and the avoidance of death by the entire plant is brought about, as will presently be seen, by the development of adventitious buds.

The duration of the life of a branch naturally depends on that of the branchlets into which it is ultimately subdivided, and the life limit of these in turn, hangs partly at least on a proper balance between the production of flowers and of leaves, and possibly also to some degree on the length of the branch itself.

In order to carry on the life of the branch any twig must produce each season at least one leaf bud, whether it gives rise to flowers or not. Thus when flowers are also formed, the branchlet has a double burden. Now it happens when the branches are relatively long, that the vegetative (axillary buds) may not develop, the flower bud only doing so, and therefore the death of the twig follows with the ripening of the fruit.

Whether both flower and leaf buds develop the same season on the same twig depends apparently on the presence of suitable and

sufficient food as one or two facts seem to indicate. In the first place, branches evidently past their prime and relatively long, bear as a rule undersized leaves, and, as given previously, on such branches, a greater per cent. of flower buds than of leaf buds, or, than of flower and leaf buds, are found to undergo development. But, secondly, if for any cause the flower bud is killed, as by late spring frosts, it invariably happens that one and generally more of the axillary buds grow into as many branchlets.

Finally it is conceivable that the death of a sufficient number of twigs, by over-production of flowers, might in the end cause

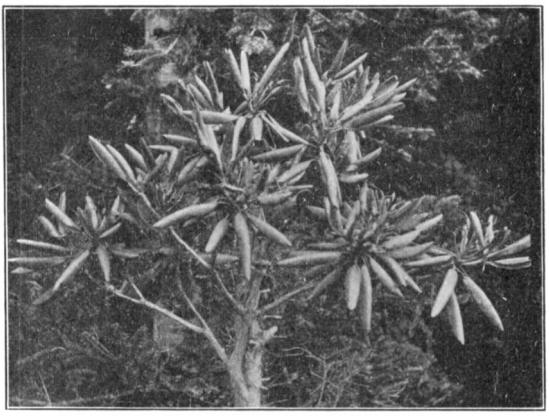

FIG. 4. Fruits of *Rhododendron Catawbiense* of the present and the past year are shown; also flower and leaf buds; and leaves of the past and the present year. The leaves are partially removed to expose the flower buds.

the death of the entire plant. This however does not occur, as will presently appear.

When the rhododendron plant has reached a certain size, or more accurately a certain stage in its life history, it begins to put out branches, or suckers from the level of the ground or near it. Precisely what the stage in the development of the shrub is, when this takes place, is not easy to determine. It is probably associated with the over-production of flowers, and the consequent suppression of the development of leaf buds and is likely therefore concerned with questions of nutrition.

The course of the development of the suckers, or secondary

branches may be outlined as follows: A few small branches may be seen to rise from the bases of the larger ones in almost any mature shrub. When the older branches may be said to reach a state of senescence, by reason of overflowering, the suckers are noticeably abundant and relatively large, and finally, by the time the twigs of the parent branch are dead, they have assumed its form, have taken on its functions and have gradually replaced it. Through the vegetative rejuvenescence the rhododendron as a plant normally does not die, and it therefore may be considered, as Muir looks upon the big tree, as practically immortal.

A KEY TO THE NORTH AMERICAN SPECIES OF CORTINARIUS. — I

By F. S. Earle

The genus *Cortinarius* is one of the largest and most interesting among the mushrooms, many of the species being of considerable size and very attractive in coloring. As a rule they are found during late summer and fall, many of them occurring after the weather has become quite cool. Many of the species are edible and so far as known none of them are dangerously poisonous.

The sections and subgenera in *Cortinarius* are for the most part quite well marked and the study of the genus is made difficult by the great number of species and our limited knowledge of them rather than by any lack of good specific characters. In this genus the study of the earlier stages as well as of the fully developed plant is unusually important. The color of the young lamellae in particular should always be noted.

It should be borne in mind, as was stated at the beginning of this series of papers, that these keys are based on the existing literature only, and not on a study of the plants themselves. They are intended solely as an aid to the beginning of the serious study of these interesting plants and not to express final convictions in regard to their relationships.